January 3, 2013

Comments on the *Draft Baseline Human Health Risk Assessment (BHHRA)*, for the San Jacinto River Waste Pits Superfund Site, dated December 2012, provided on behalf of the Port of Houston Authority

On behalf of the Port of Houston Authority (PHA), HDR has reviewed the draft BHHRA (December 2012). Review of the BHHRA was performed concurrent with review of the Remedial Investigation (RI) report (December 2012); therefore, some comments may be repeated or cross-referenced and some changes recommended to be made in the BHHRA require consequential changes in the RI. This review refers to many prior documents, and comments to the critical documents have been previously submitted to EPA. Where prior comments apparently have not been addressed, and warrant emphasis in this BHHRA review, the comments are restated. In reviewing the BHHRA, HDR has acquired and considered the Public Health Assessment for the San Jacinto River Waste Pits, prepared by the Texas Department of State Health Services (TDSHS), dated October 2012. This review of the BHHRA focuses on analytical methods used, checks for consistency with Risk Assessment guidance, and verifies representative analyses and the interpretation of results. The comments below are referenced to pages and sections of the BHHRA.

General Comments:

- The BHHRA was prepared in accordance with prior technical memoranda and other submittals to the U.S. Environmental Protection Agency (USEPA) (e.g. Exposure Assessment Memorandum [EAM, 2012]; Toxicological and Epidemiological Studies memorandum [TESM, 2012]; and the RI Work Plan), where many key aspects of the BHHRA were reportedly discussed, vetted, and approved by EPA. These items include but are not limited to:
    - Selection of Chemicals of Potential Concern (COPCs)
    - Elements of baseline and post-TCRA analysis
    - Conceptual site models (CSMs)
    - Definition of exposure units
    - Exposure media of focus
    - Human health receptors
    - Toxicological data
    - Specific approaches to evaluate dioxins and dioxin like compounds in a human health risk assessment.

  HDR recognizes that these assumptions have been integrated into the BHHRA; however, it is understood that EPA will verify appropriate interpretation of its prior approvals. Specific comments are offered below on items where we feel there is unclear application of Risk Assessment guidance (or a lack of reference back to prior agreement by EPA).

- The BHHRA is presented in general accordance with EPA guidance, and the narratives, figures, and tables provide transparency.

  Comments (and PRPs' responses to comments (RTCs) on the Exposure Assessment Memorandum (EAM) were reviewed. The PRPs were responsive to many comments, with additional information /

citations being provided in the Draft BHHRA. Some comments, however, will require further consideration by EPA, as follows:

- Method of combining risks to assess diet consisting of multiple fish / shellfish;
- The inclusion of beach areas B/C and D in the post-TCRA analysis.

The final approach may result in increases in receptor risk estimates that may exceed EPA's criteria (e.g., Hazard Index (HI) > 1.0 or Excess Lifetime Cancer Risk (ELCR) > 1×10^{-4}).

- Note that site noncancer hazards and dioxin cancer hazards due to sediment and tissue exposure for some receptors exceed EPA acceptable limits in the baseline reasonable maximum exposure (RME) risk assessment. Dioxins and PCBs contribute to sediment risks; dioxins, mercury, and total PCBs are drivers for tissue.

- Remedial decisions are usually based on results of Baseline RME risk calculations; therefore, the results of the post-TCRA, central tendency, refined (background), and probabilistic risk evaluations should be separated from the baseline RME risks. The separation of the Baseline RME from additional analyses is particularly appropriate, as there are issues related to the derivation of these varied analyses; for instance, data gaps exist in post-TCRA media sampling that limit the ability to fully assess remaining contamination. It is recommended that EPA require that the analyses beyond Baseline RME be included in the uncertainties section of the BHHRA.

Specific Comments:

P. 1-3 Last sentence of Section 1.2. "There is no basis for assuming ..... that baseline conditions would have continued to exist had the TCRA not been implemented." On the contrary, in the absence of TCRA, baseline conditions would likely have persisted for some indeterminate time. EPA should direct PRPs to remove this statement and any consequent calculations in the BHHRA.

P. 3-2 Section 3.1.2.2 Tissue. The discussion correctly notes the uncertainty in relating the catfish tissue analyses for COPCs to ingestion risks. It is asserted in this section that no data are available on use of the Site for fishing, but the absence of this data is a failure of the RI, and the deficiency must be met with conservative assumptions. There is uncertainty in fish tissue analyses and use of those data. No records have been offered as to the sizes / ages of fish used in the tissue analyses compared to those eaten. Larger fish tend to have higher concentrations of contaminants. Smaller fish tend to be more readily caught in sampling programs. Data needs to be provided to document why the analyses of tissue from the RI program (which caught few fish), represents the tissue concentrations of the COPCs used in the BHHRA. In addition, while this section claims that use of catfish is conservative relative to other species, no data (or literature reference) showing lower concentrations in other edible finfish species relative to catfish is offered. EPA should require documentation that the fish tissue analyzed is representative of the ages of fish likely to be consumed. If those data are not available, a credible projection of contaminants in mature catfish should be offered.

P. 3-4 Section 3.1.2.3 Soil. Use of shallow subsurface soil data (6" – 12" below grade) is used for the commercial worker receptor in the area south of I-10. If deeper (> 2 ft) soil data exists, it should be evaluated in light of potential exposures to contaminants that may be encountered by landscaping or hand excavations.

P. 4-4 and 4-5 (Toxicity Factors for dioxins and furans). A threshold-based tolerable daily intake (TDI) of 2.3 pg/kg-day for dioxins and furans was considered to be a Tier 3 criterion and used to evaluate the cancer hazard from dioxin/furan exposure. The use of the 2001 World Health Organization cancer toxicity value has reportedly been approved by EPA for the project, but must be confirmed, particularly in light of EPA's release of the Dioxin Reanalysis. Further, EPA released the *Reanalysis of Key Issues Related to Dioxin Toxicity and Response to NAS Comments, Volume 1* on February 17, 2012, providing hazard identification and dose-response information on 2,3,7,8-TCDD and analysis of non-cancer health effects. This report includes an oral reference dose (RfD) and description of the underlying data and analyses. Volume 2 will likely provide information on dose-response modeling of the cancer endpoints and quantitative uncertainty analysis. Note that a brief sensitivity analysis is provided in the BHHRA for assessing alternate dioxin cancer risk calculations (vs. the cancer hazards presented in the BHHRA) by utilizing cancer slope factors historically used by EPA. As EPA strives for consistency in risk assessment across NPL sites, this sensitivity analysis deserves greater discussion in the main text of the BHHRA.

P. 5-2 Exposure Units: Exposure Units were identified based on a statistical analysis of the media-specific data sets. This process was documented in the EAM, which HDR's risk assessors have not reviewed in detail but which we assume has been reviewed and approved by EPA. The BHHRA notes (e.g., in Figure 5-4) that the TCRA limits access to all beach areas except Beach Area A; therefore, only that area is defined as an exposure unit for post-TCRA risk analysis for both sediments and soils. EPA Comment #8 on the EAM requested that additional Beach Areas be included in the BHHRA's Post-TCRA analysis, but f only Beach Area A has been included.

P. 5-9 Section 5.1.2.2.2 Common Parameters. As noted earlier, human health exposure factors – including the common parameters – were reportedly reviewed and approved by EPA in the EAM. The following points, however, are noted:

- The lack of site-specific information on fishing and recreational behaviors is a potential deficiency of the RI, which carries forward into the BHHRA. Use of conservative values based on best professional judgment adds uncertainty to the risk assessment, but is often the best approach to complete quantitative evaluations. This added uncertainty might have been avoided by requiring the PRPS to acquire site-specific data.
- Several of the Common Exposure Factors used in the BHHRA (deterministic calculations) are different from those utilized on other EPA projects and prescribed in EPA's *Exposure Factors Handbook* (1997, 2011) and EPA's *Child-Specific Exposure Factors Handbook* (2008). Examples are noted below (with alternative value and comment on whether risk would be increased or decreased if the alternative value were to be used):
    - Cancer averaging time, 78 years used in BHHRA (vs. 70 years; alternative value would lead to an increase in forward risk calculations)
    - RME exposure duration, 33 years used in BHHRA (vs. 30 years; alternative value would lead to a decrease in forward risk calculations)
    - Adult/Child Body weights, 80/19 kg used in BHHRA (vs. 70 or 15 kg; alternative value would lead to increases in forward risk calculations)

Note that HDR spot-checked exposure equations of the EAM, and appear generally appropriate and in accordance with known HHRA guidance. It is noted, however, that for soil and sediment exposures (ingestion), a relative bioavailability adjustment (RBA) is applied. The conservative default value (100%) is

commonly used, but for two COPCs (arsenic and dioxins/furan) a factor of 50% is used in the baseline RME calculation. The use of RBA's less than 100% in the deterministic baseline assessment should be explained in more detail.

P. 5-11 2nd paragraph, Section 5.1.2.2.2 Parameters for Tissue Ingestion. Citations should be provided to demonstrate that the assumed percentages of fish caught from the Site and that are then consumed by the Recreational receptors (25% of total fish diet for RME and 10% for central tendency exposure [CTE] analysis) are conservative values. Given the exposure setting and the receptor assumptions, it is possible that greater percentages of fish in the receptors' diets could originate from the site area. It should be noted, however, that 100% of fish ingested are assumed to be from the site for the subsistence fisher receptor.

P. 5-12 4th paragraph, Section 5.1.2.2.2 Parameters for Direct Contact. PRPs assume values of skin adherence within the range of published values, but this method may not account for the fact that the Site COCs, and especially dioxins, are preferentially associated with fine grained sediment (and sediment with higher organic carbon content). EPA should evaluate the need to assume a higher adherence factor based upon this Site's conditions.

P. 5-41 Bottom of 1st paragraph, Section 5.2.3.3.1. The probabilistic risk assessment (PRA) assumes (referencing Tables 5-8, 5-9) that each variable is independent, except for dependence of skin area on body weight. The PRA discussion should also recognize the relationships among other exposure factors (i.e., ingestion rates may be dependent on body weight and age). The PRA should clearly specify what exposure factors / exposure factor statistics were applied to develop the 50th, 90th, and 95th percentile risk estimates.

P. 5-42 line 20, Section 5.2.3.3.1. The reference to Table 5-22 should cite values of 0.4, 2, and 3 (not 4). If 4 is asserted to be correct, however, the PRPs should clarify the reference and source of this value. The same error seemingly appears on P. 5-43, line 12.). It is requested that the PRA summary tables be checked against the text.

P. 5-43 bottom sentence, Section 5.2.3.3.1. Reference to Figure 5-8 claims "incremental additional hazard" relative to background. The Figure minimizes the effect by using a wide range of hazard index values. If the figure showed the range of interest, hazard indices between 0.1 and 10, the difference between the HI of the area evaluated and background would be shown more clearly. The site area has approximately 22% greater risk index than background in this illustration. The text should objectively describe the results depicted in the Figure.

P. 5-45 Section 5.2.4.1. This section fails to note and evaluate the known biases in fish sampling. No sampling truly represents the population sizes caught by fishers. Most sampling techniques catch smaller fish than those sought and eaten by anglers. This bias is especially significant in this analysis, because the COPCs (including mercury, dioxins and PCBs) accumulate to higher tissue concentrations in older and larger fish. This fact is potentially a major bias, and the BHHRA may grossly underestimate Site risks. The bias is compounded by great uncertainty in this key variable because few fish were caught and analyzed to define COPC tissue concentrations, and tissue ingestion is a significant exposure route throughout the analyses of the BHHRA. See also the comment offered above for Section 3.1.2.2 Tissue.

P. 5-51 Top paragraph, Section 5.2.4.3.2 and Section 5.2.4.3.3. The general population description should note the widely reported tendency for Afro-American and other demographic groups to consume greater (or lesser) amounts of fish (EPA, Region 9 Seminar 2004), and its importance to interpreting the BHHRA results.

P. 5-56 Middle paragraph, Section 5.2.4.3.4. See prior notes at p. 5-12, Section 5.1.2.2.2.

P. 5-58 Top paragraph, Section 5.2.4.4.1 (Also noted in Section 4). EPA should require that the BHHRA describe the implications of both approaches to dioxin risks (i.e., use of cancer slope factor vs. cancer hazard approach), so that the most conservative and appropriate approach can be applied to the site.

As noted at the outset, some similar analyses have been performed by TDSHS in its Public Health Assessment for the Site (finalized in October 2012). In the Assessment, three potential pathways of exposure are identified: sediment ingestion, sediment dermal contact, and ingestion of fish and/or crabs, consistent with pathways evaluated in the BHHRA. The Assessment also includes three varying fishermen exposure scenarios, including adult fishermen (at a subsistence, and two less intense, i.e., weekend and sporadic, levels of exposure) and their respective children's exposure. The Assessment concludes that direct ingestion of sediment results in an unacceptably increased risk of cancer and non-cancer effects, and increased cancer risk from ingestion of fish/crabs. Seafood ingestion was considered the greatest health risk. Exposures to groundwater, surface water and airborne contamination were not seen as causing unacceptable risk levels. Exposures that occurred pre-TCRA and as a result of prior industrial activity were noted as a concern. The data set used in the Public Health Assessment did not include RI data, but did include information from other state and federal (e.g., dioxin Total Maximum Daily Load [TMDL] project) investigations in the area of the Site. While assumptions and interpretations differ between the TDSHS Assessment and the BHHRA, there are many consistent analyses (e.g., risk assessment methods used and identification of media of concern) that lend credibility to both analyses.

Any questions concerning these comments should be communicated to Linda Henry, Port of Houston Authority.

Sincerely,

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